THE GENUS *WALCHIELLA* (ACARINA, TROMBICULIDAE).

By Robert Domrow, Institute for Medical Research, Kuala Lumpur.*

(Sixty-three Text-figures.)

[Read 30th May, 1962.]

Synopsis.

Material from the type series of all except one of the species ascribed to *Walchiella* has been examined to check the status of the two species described by Gunther. His *impar* is a valid species, with *asonluca* Traub and Audy as a synonym. His *bodensis* is a synonym of Walch's *oudemansi*. All other names (excluding a *nomen nudum, clauda* Gthr.) are considered valid. *Walchiella beauforti,* n. sp., is described from a porcupine, *Thecurus crassispinis* (Hystricidae) from North Borneo. A key is provided, and new illustrations for little known species.

The long-standing uncertainty about synonymy within *Walchiella,* and the opportunity of describing a new species from Borneo, have induced me to study this group, which Vercammen-Grandjean (1960) and Domrow (1960) both accord generic status among the trombiculines. Including the new species, twelve names have now been proposed for species of this genus. Two of these are synonyms (*asonluca* and *bodensis*), and one a *nomen nudum* (*clauda*), leaving nine species recognized here as valid. These may be disposed in two species groups according to the segmentation of the legs (Audy and Domrow, 1957). While preparing this paper, I have been able to examine material from the type series of all but one species, the common and characteristic *oudemansi*. Illustrations are given for all species, except two (*oudemansi* and *calunosa*) for which reliable figures have already been published. Documentation is limited to the original reference to each species and synonym, but more complete lists of references may be found in Wharton's manual (1952). Several important corrections to original descriptions have been given by Womersley and Audy (1957).

Genus Walchiella Fuller.

Walchiella Fuller, 1952, in Wharton (1952), *Mem. ent. Soc. Wash.*, 4: 95. Undated, but not earlier than March from internal evidence, see p. 150.

Walchiella Fuller, 1952, *Zool. Verh.*, 18: 220. December 12.

Type-species by monotypy *Trombicula oudemansi* Walch, 1922, *Geneesk. Tijd. Ned.-Ind.*, 62: 563.

It seems clear that the ascription of *Walchiella* to Fuller alone is correct. Wharton uses the phrase "aided by H. S. Fuller" on the title page of his manual, and on p. 95 expressly credits the genus to his associate, thus: "Genus *Walchiella* Fuller, new genus." This publication presumably antedates Fuller's study of the Oudemans collection, which is dated December 12.

Key to larvae of genus Walchiella.

1. Legs 7.7.7-segmented, with femora divided (the *lacunosa* species group) ..... 2.
   Legs 7.6.6-segmented, with femora II and III undivided (the *oudemansi* species group) .. 5.
2. AL noticeably shorter than AP ..... 3.
   AL decidedly longer than AP ..... 4.
3. Sensillae symmetrical; PL = AL ..... *beauforti.*
   Sensillae asymmetrical; PL < AL ..... *lacunosa.*
4. AL shorter than PW ..... *sarawakensis.*
   AL longer than PW ..... *nadchatrami.*
5. Chelicerae dentate ..... *oudemansi.*
   Chelicerae simple ..... 6.

* On half-time loan from the Queensland Institute of Medical Research, Brisbane, to participate in a project "Bionomics of Oriental-Australasian acarine vectors" sponsored by the George Williams Hooper Foundation (University of California Medical Center), and supported by U.S. Public Health Service Grant E-3793.

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6. Dorsal setae set on distinct platelets ..... *traubi.*
Dorsal setae set directly in cuticle ..... 7.
7. With more than 40 dorsal setae ..... *lewthwaitei.*
With 28-30 dorsal setae ..... 8.
8. Second and fifth setae in first dorsal row longer than remainder; AW < 53, PW < 71 ..... *impar.*
Setae in first dorsal row of uniform length; AW > 65, PW > 94 ..... *calunosa.*

THE *LACUNOSA* SPECIES GROUP, AUDY.

Diagnosis.—Legs 7.7.7-segmented, with femora divided.

WALCHIELLA BEAUFORTI, n. sp. Figs 1–12.

Diagnosis.—AL < AP; PL = AL; sensillae symmetrical.

Type Material.—Holotype larva (27461) and six paratype larvae (27454, 6, 8 and 31529, 32, 3) from a porcupine identified by J. L. Harrison as *Thecurus crassispinis* (Günther) (Hystricidae), R18638, Beaufort, British North Borneo, 18.v.1952, joint Colonial Office—U.S. Army Medical Research Units expedition. Holotype larva in British Museum (Natural History), London; paratypes in U.S. National Museum, Washington; Rocky Mountain Laboratory, Hamilton; and both my laboratories.

Larva.—Size of idiosoma (mounted) in slightly engorged specimens from 319 × 242 to 374 × 286μ; in engorged specimen 550 × 374μ.

Body Setation.—Dorsal setae cylindrical, shortly barbed, and arranged 2.6.3/3.10.8.8.6.2 in specimen illustrated. Humeral setae single, 52–54μ long; DS 44–46μ long; CS 34–40μ long. Ventral setae about 40 in number, those near anus 27–29μ long. Sternal setae 2.2.

Standard Data in Micra of Larval Scutum of W. beauforti *n.sp.*

AW.	PW.	SB.	ASB.	PSB.	SD.	AP.	AM.	AL.	PL.	Sens.
68	77	42	26	23	49	39	—	34	—	—
67	72	39	25	23	48	40	48	36	33	51×9
67	72	38	25	24	49	39	47	32	36	—
66	77	38	—	23	—	—	42	32	34	—
68	74	40	26	23	49	39	46	33	35	—
—	—	—	—	—	—	—	—	—	34	49×9

Scutum subrectangular and punctate over almost entire surface. Anterior margin with marked convexity around AM setal base. Lateral margins straight. Posterior margin shallowly biconvex. All scutal setae shortly barbed; AM > PL = AL. Sensillae quite clavate, and slightly attenuate distally. SB wide apart, slightly nearer to level of PL than that of AL. Eyes 2 + 2.

Gnathosoma.—Galeal setae nude. Chelicerae with distinct dorsal tooth just behind tricuspid cap. In addition to tarsala, the palpal formula is n.n.nnb.B + 6b.S. Tibial claw 3-pronged.

Legs all 7-segmented. Femora II and III divided, the ventral seta being branched. Specialized setation as follows—*Tarsus I* with pretarsala, subterminala, parasubterminala, tarsala and microtarsala; *tibia I* with two tibialae and microtibiala; *genu I* with three genualae and microgenuala. *Tarsus II* with pretarsala, tarsala and microtarsala; *tibia II* with two tibialae; *genu II* with genuala. *Tibia III* with tibiala; *genu III* with genuala. Tarsus I with basal and distal bars.

WALCHIELLA LACUNOSA (Gater). Figs 13–20.

Neoschöngastia lacunosa Gater, 1932, *Parasitology*, 24: 156.

Diagnosis.—AL < AP; PL < AL; sensillae asymmetrical.

Material Examined.—Eight of Gater's paratype larvae from *Rattus sabanus vociferans*, Sungei Buloh, Selangor; forty-nine larvae from Ulu Langat, Selangor, as follows—thirty-four from *R. sabanus*, 7.vii.1950, 11.i.1951, 22.iv.1952, 26.viii.1952, 18.xi.1952; five from *R. bowersi*, 7.v.1952; ten from a civet, *Prionodon linsang* (Viverridae), 13.i.1953.

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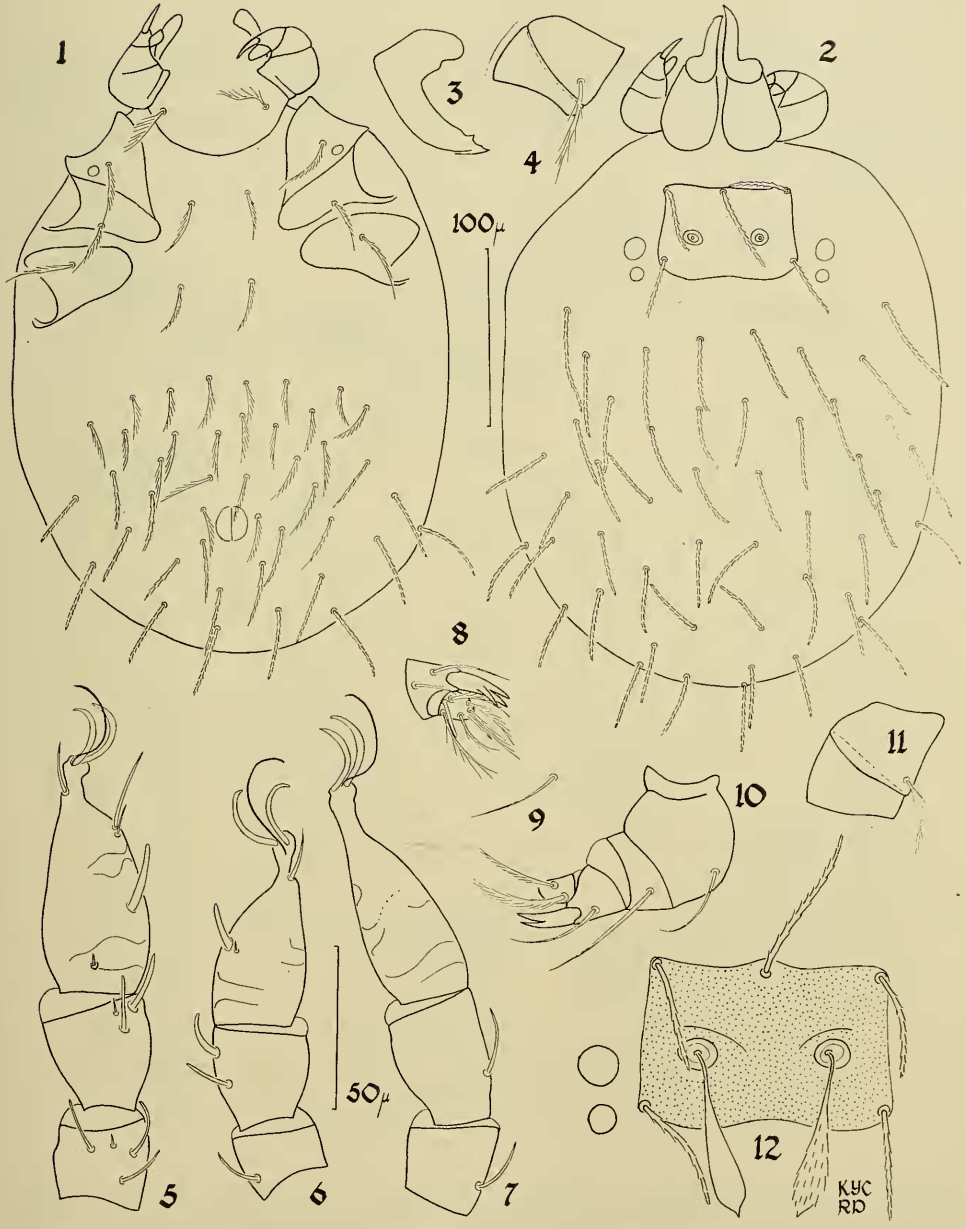
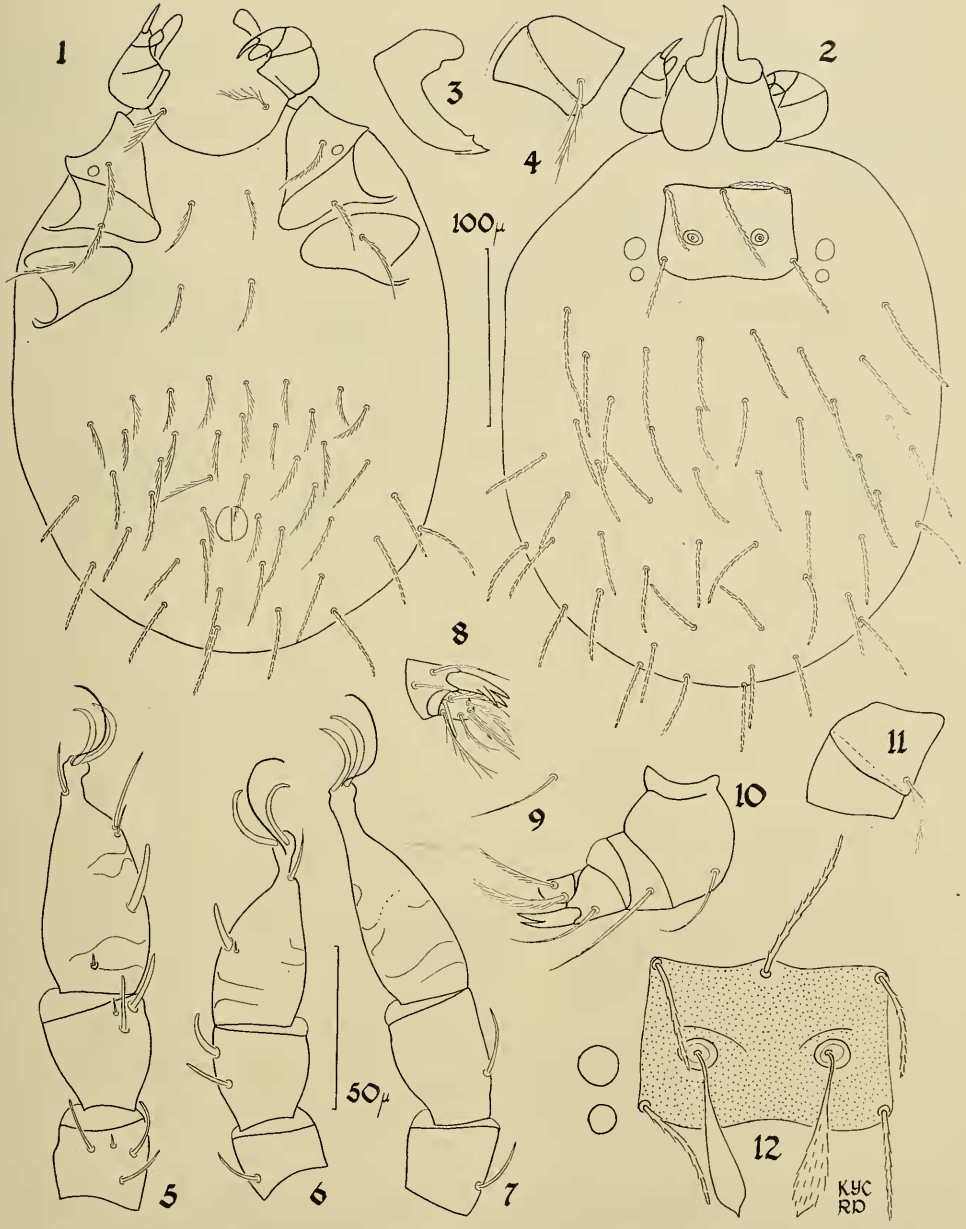


Text-figs 1-12. *Walchiella beauforti*, n. sp.—1, Venter of body; 2, Dorsum of body; 3, Chelicera in lateral view; 4, Basi- and telofemur II; 5, 6 and 7, specialized setation of legs I II and III, respectively; 8, External aspect of palpal tibiotarsus; 9, Galeal seta; 10, Internal view of palp; 11, Basi- and telofemur III; 12, Scutum and eyes.



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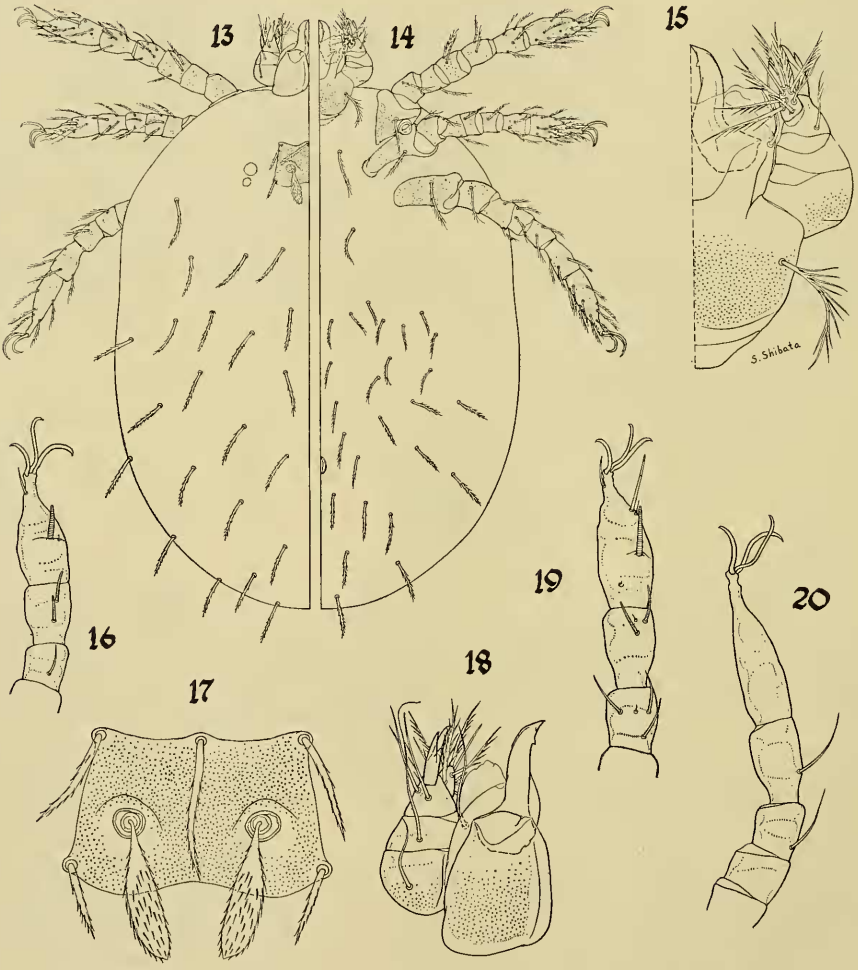
Walchiella sarawakensis (Womersley). Figs 21–28.

Schöngastia (*Ascoschöngastia*) *sarawakensis* Womersley, 1952, *Rec. S. Aust. Mus.*, 10: 201.

Diagnosis.—AL > AP; AL < PW.

Material Examined.—One larva from a moon-rat, *Echinosorex gymnurus* (Erinaceidae), Fort Leju, Tinjar, Sarawak, 15.vi.1950 (same collection data as type series); two larvae from *Rattus mülleri*, Fort Leju, 23.vi.1950; eight larvae from *Rattus* sp., Sarawak, 5.vi.1958.



Text-figs 13-20. *Walchiella lacunosa* (Gater).—13, Dorsum of body; 14, Venter of body; 15, Ventral view of gnathosoma; 16, Specialized setation of leg II; 17, Scutum; 18, Dorsal view of gnathosoma; 19 and 20, Specialized setation of legs I and III, respectively.

Walchiella nadchatrami (Womersley). Figs 29–36.

Schöngastia (*Ascoschöngastia*) *nadchatrami* Womersley, 1952, *Rec. S. Aust. Mus.*, 10: 200.

Diagnosis.—AL > AP; AL > PW.

Material Examined.—Two paratype larvae from *Rattus sabanus*, Bukit Lanjan, Selangor; six larvae from *R. rajah surifer* as follows—one from Kepong, Selangor,

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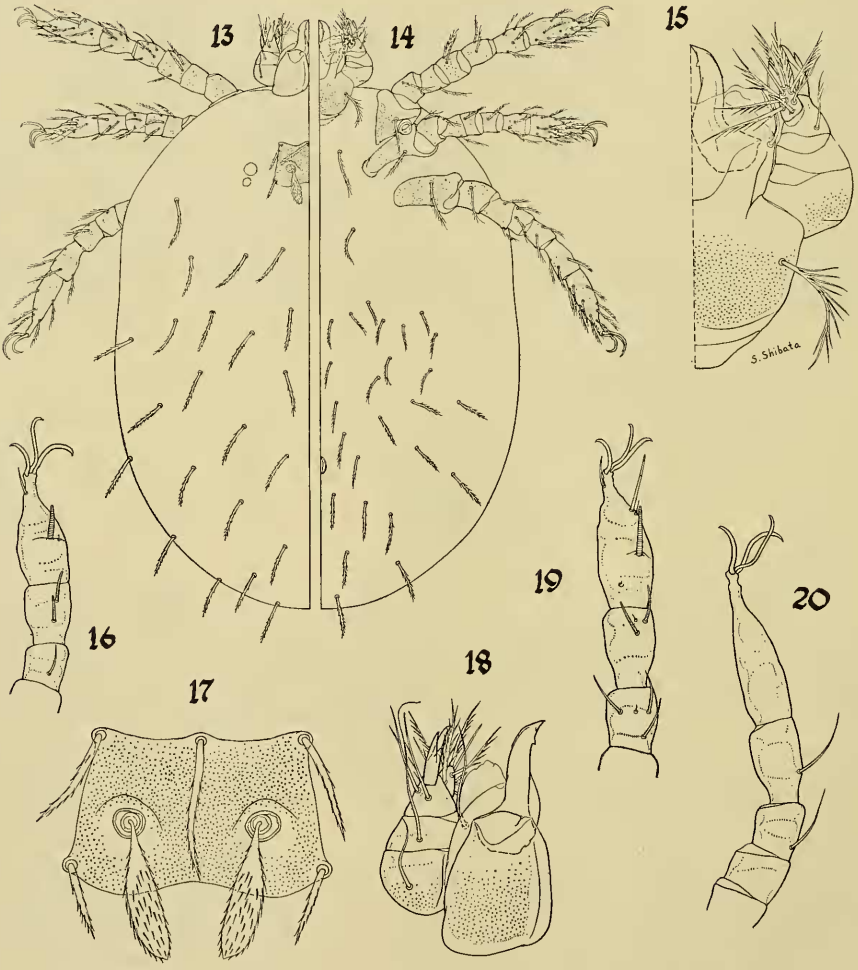

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THE *OUDEMANSI* SPECIES GROUP, AUDY AND DOMROW.

Diagnosis.—Legs 7.6.6-segmented, with femora II and III undivided.

WALCHIELLA IMPAR (Gunther). Figs 37–44.

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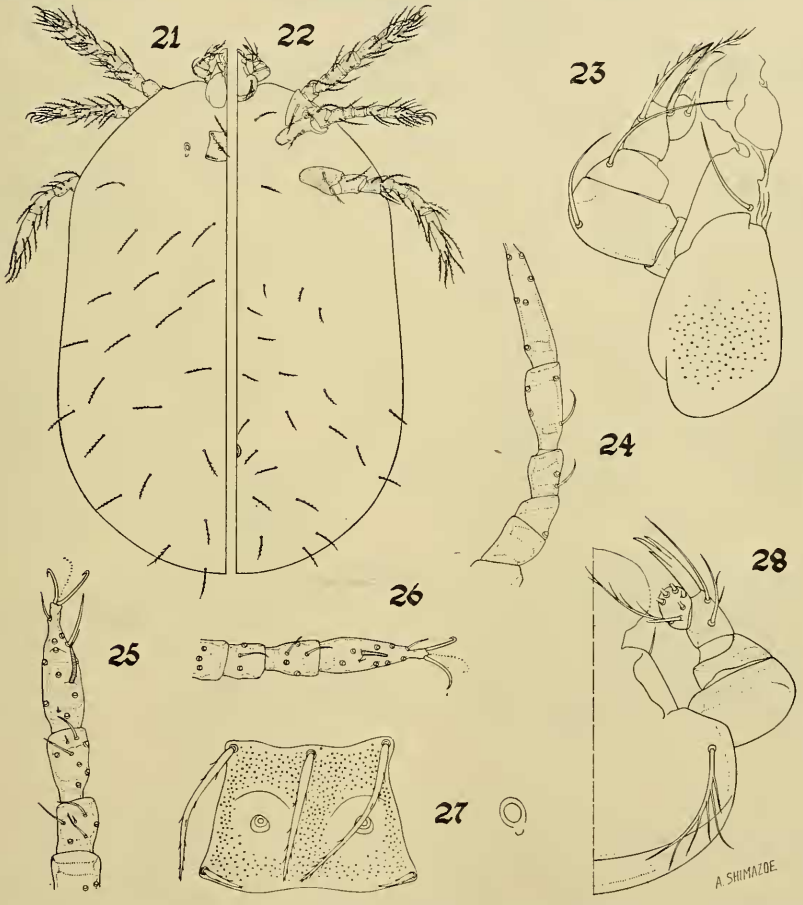

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Diagnosis.—Chelicerae simple; dorsal setae not set on platelets; with 28–30 dorsal setae; second and fifth setae in first dorsal row longer than remainder; scutum small.

Material Examined.—Of *impar*, the lectotype larva and four paratype larvae designated by Audy from Gunther's material, host unknown; two larval "type specimens" of Gunther, host unknown; two larval "paratypes" remounted and relabelled from Gunther's material by Womersley from a marsupial bandicoot. *Echymipera kalubu*

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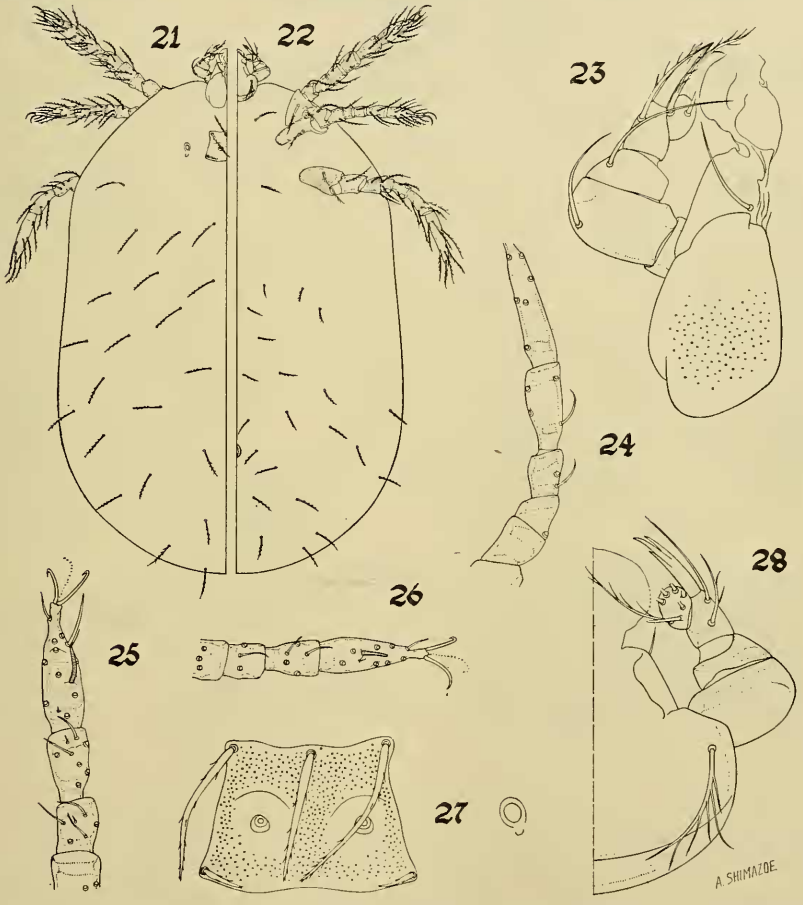

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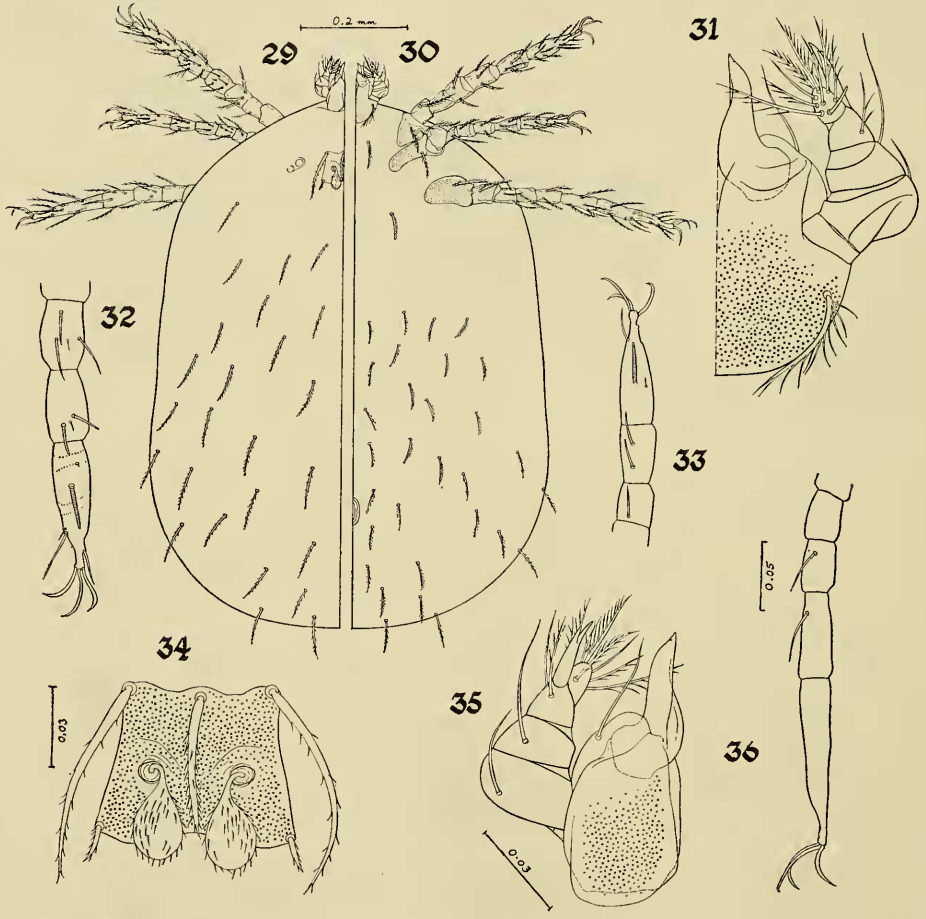
*kalubu** (Peramelidae); three larvae remounted by Womersley, but with Gunther's label, *E. k. kalubu*; twelve larvae mounted by Gunther, still attached to strip of ear margin of *Rattus browni*. All of this material of Gunther is from Bulolo, New Guinea. Further specimens examined from New Guinea are two larvae from *R. exulans concolor*, Sansapore, C. Mohr; four larvae from *R. ruber ringens*, Sansapore, C.M.; four larvae from juvenile rat, Sansapore, 1944, C.M.; two larvae from *E. k. kalubu*, Sansapore, W. D. Fitzwater; nineteen larvae, ear of rat, Lae, 1, 2 and 3.viii.1944, C. Davis.



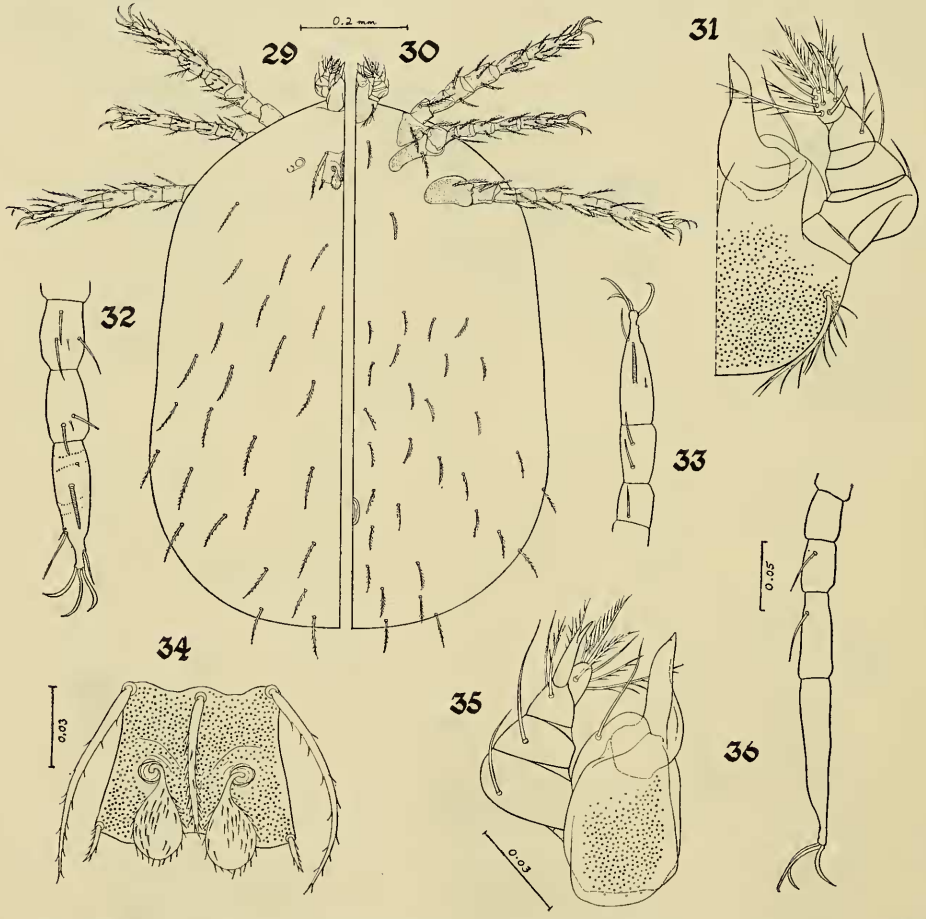
Text-figs 29-36. *Walchiella nadchatrami* (Womersley).—29, Dorsum of body; 30, Venter of body; 31, Ventral view of gnathosoma; 32 and 33, Specialized setation of legs I and II, respectively; 34, Scutum; 35, Dorsal view of gnathosoma; 36, Specialized setation of leg III.

Of *asonluca*, two paratype larvae from *Tupaia tana* (Tupaiidae), Stapok Road, Kuching, Sarawak; twenty-four larvae from *T. glis ferruginea*, Kuching, 22.xi.1950.

Notes.—In Audy and Domrow (1957), the four paragraphs under "Remarks" on *W. impar* were added by one of us at the last moment. In view of Gunther's descriptions of the chelicerae of *impar* and *bodensis*, I would have then been dubious as to their synonymy. Now, after an examination of authentic material of both species, I agree with Audy that *W. impar* is distinct from *W. oudemansi*, but find *bodensis* a synonym of the latter.

* This and certain other host names have been amended according to modern authorities, after Womersley and Audy (1957).

*kalubu** (Peramelidae); three larvae remounted by Womersley, but with Gunther's label, *E. k. kalubu*; twelve larvae mounted by Gunther, still attached to strip of ear margin of *Rattus browni*. All of this material of Gunther is from Bulolo, New Guinea. Further specimens examined from New Guinea are two larvae from *R. exulans concolor*, Sansapore, C. Mohr; four larvae from *R. ruber ringens*, Sansapore, C.M.; four larvae from juvenile rat, Sansapore, 1944, C.M.; two larvae from *E. k. kalubu*, Sansapore, W. D. Fitzwater; nineteen larvae, ear of rat, Lae, 1, 2 and 3.viii.1944, C. Davis.

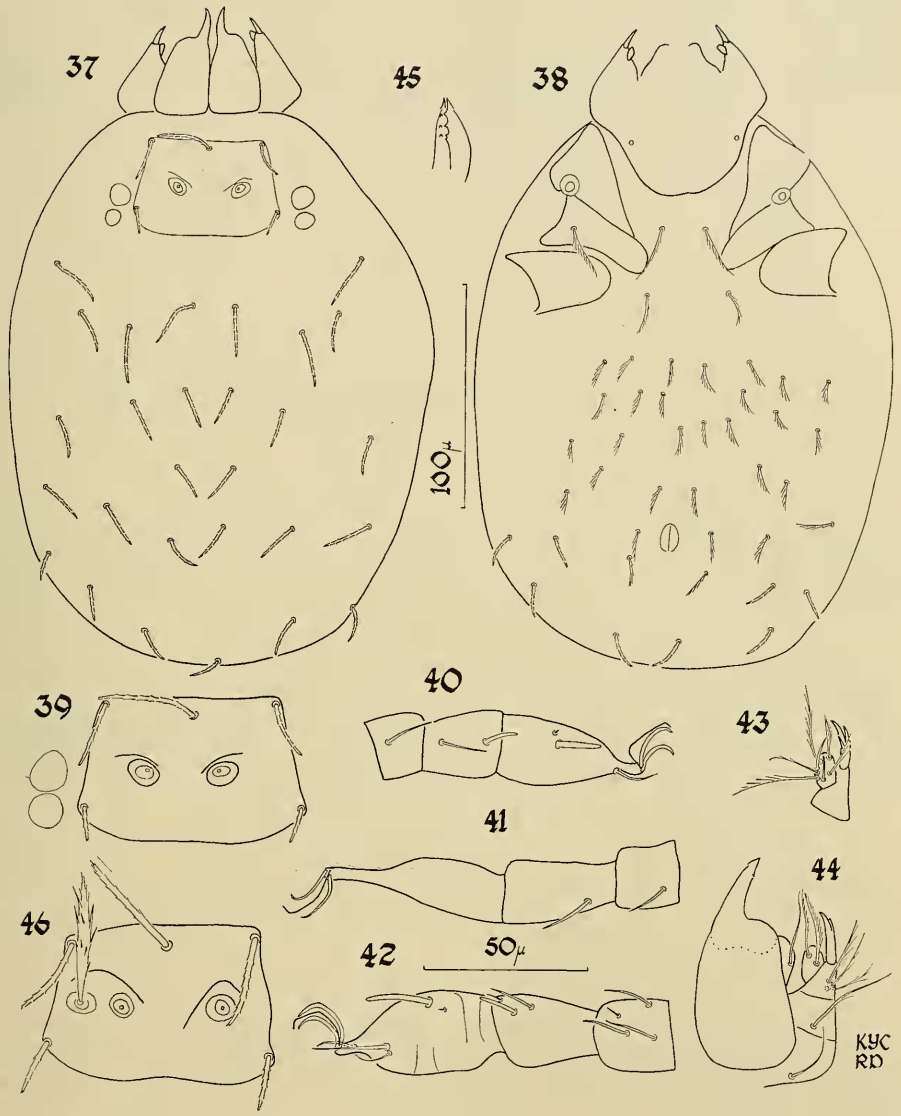


Text-figs 29-36. *Walchiella nadchatrami* (Womersley).—29, Dorsum of body; 30, Venter of body; 31, Ventral view of gnathosoma; 32 and 33, Specialized setation of legs I and II, respectively; 34, Scutum; 35, Dorsal view of gnathosoma; 36, Specialized setation of leg III.

Of *asonluca*, two paratype larvae from *Tupaia tana* (Tupaiidae), Stapok Road, Kuching, Sarawak; twenty-four larvae from *T. glis ferruginea*, Kuching, 22.xi.1950.

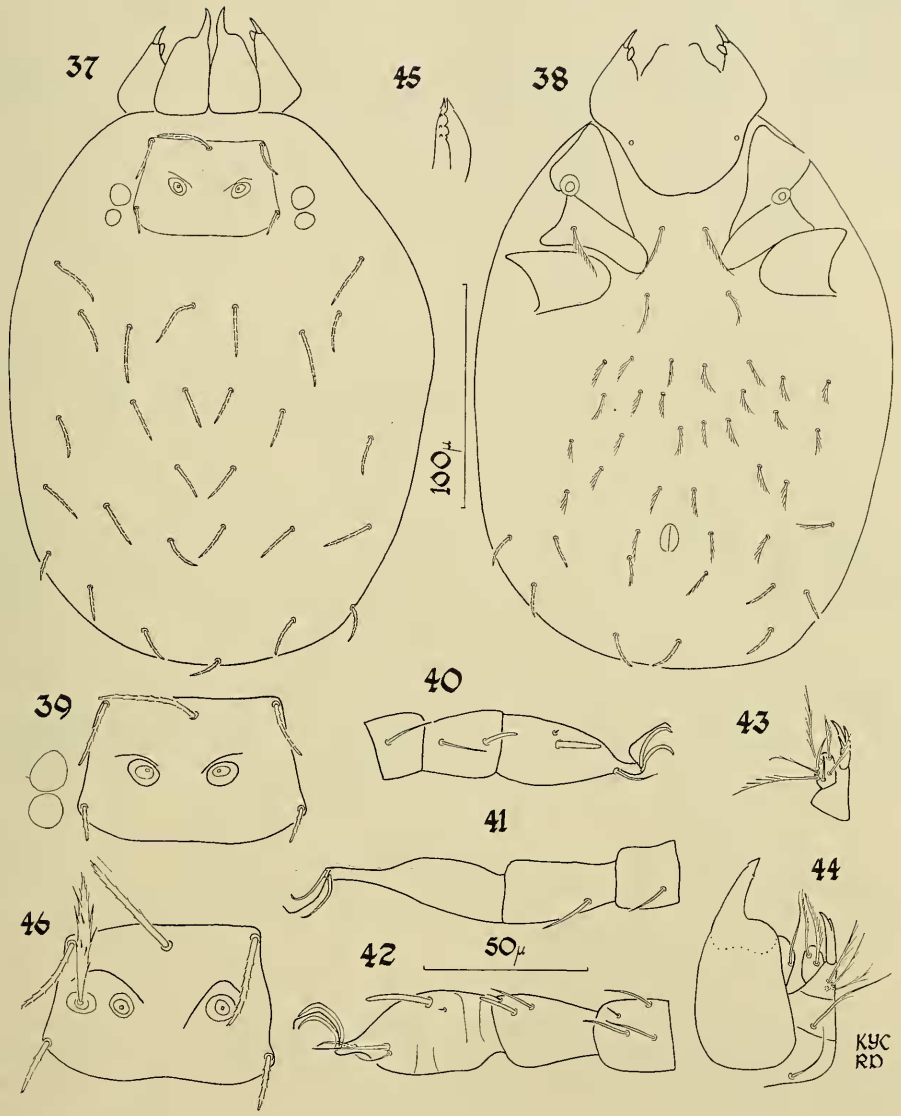
Notes.—In Audy and Domrow (1957), the four paragraphs under "Remarks" on *W. impar* were added by one of us at the last moment. In view of Gunther's descriptions of the chelicerae of *impar* and *bodensis*, I would have then been dubious as to their synonymy. Now, after an examination of authentic material of both species, I agree with Audy that *W. impar* is distinct from *W. oudemansi*, but find *bodensis* a synonym of the latter.

* This and certain other host names have been amended according to modern authorities, after Womersley and Audy (1957).



Text-figs 37-44. *Walchiella impar* (Gunther).—37, Dorsum of body; 38, Venter of body; 39, Scutum and eyes; 40, 41 and 42, Specialized setation of legs II, III and I, respectively; 43, Ventral view of palpal tibiotarsus; 44, Dorsal view of gnathosoma. (All figures from Gunther's paratypes.)

Text-figs 45-46. *Walchiella oudemansi* (Walch).—45, Left chelicera in dorsal view, and right chelicera in dorsolateral view, of specimen from type series of *Neoschöngastia bodensis* Gunther (this figure is to a slightly larger scale than the others, having been prepared with a × 100 lens, not a × 95); 46, Abnormal scutum of larva from *Rattus mülleri,* Ulu Langat, Selangor, Malaya, 19.xi.1959. Slide 71251.



Text-figs 37-44. *Walchiella impar* (Gunther).—37, Dorsum of body; 38, Venter of body; 39, Scutum and eyes; 40, 41 and 42, Specialized setation of legs II, III and I, respectively; 43, Ventral view of palpal tibiotarsus; 44, Dorsal view of gnathosoma. (All figures from Gunther's paratypes.)

Text-figs 45-46. *Walchiella oudemansi* (Walch).—45, Left chelicera in dorsal view, and right chelicera in dorsolateral view, of specimen from type series of *Neoschöngastia bodensis* Gunther (this figure is to a slightly larger scale than the others, having been prepared with a × 100 lens, not a × 95); 46, Abnormal scutum of larva from *Rattus mülleri,* Ulu Langat, Selangor, Malaya, 19.xi.1959. Slide 71251.

Walchiella calunosa (Traub and Audy).

Euschöngastia (*Walchiella*) *calunosa* Traub and Audy, 1954, *Stud. Inst. med. Res., Malaya*, 26: 84. Figs 36–45.

Diagnosis.—Chelicerae simple; dorsal setae 28–30, uniform in length, and not set on platelets; scutum large.

Material Examined.—Four paratype larvae from *Rattus rattus baluensis*, Kamborangah, Mt. Kinabalu, 7,800′, British North Borneo.

Standard Data in Micra of Larval Scutum of W. impar (*Gunther*).*

AW.	PW.	SB.	ASB.	PSB.	SD.	AP.	AM.	AL.	PL.
47	62	25	22	21	43	31	36	19	13
48	63	26	23	22	45	31	—	21	13
49	63	27	23	—	—	31	—	19	13
50	65	27	22	22	44	31	35	21	11
60	70	32	26	23	49	32	36	21	13

* All from Gunther's paratypes, the first four exhibiting unstressed scuta. The fifth specimen has its scutum stretched and minutely cracked as figured by Traub and Evans (1957) for *Gahrliepia* (*Walchia*) *rustica* (Gater). Thus measurements involving the scutum itself are large, while the lengths of setae are normal.

Walchiella lewthwaitei (Womersley). Figs 47–55.

Schöngastia (*Schöngastia*) *lewthwaitei* Womersley, 1952, *Rec. S. Aust. Mus.*, 10: 154.

Diagnosis.—Chelicerae simple; dorsal setae more than 40, not set on platelets.

Material Examined.—Two paratype larvae from *Tupaia glis belangeri* Imphal, Manipur, India.

Walchiella traubi (Womersley). Figs 56–63.

Schöngastia (*Ascoschöngastia*) *traubi* Womersley, 1952, *Rec. S. Aust. Mus.*, 10: 222.

Diagnosis.—Chelicerae simple. Dorsal setae set on distinct platelets.

Material Examined.—One paratype larva from *Suncus* sp. (Soricidae), Shinbwiyang, Burma; four larvae from scrotum of two *Rattus niveiventer* (identified by Lim), plateau at 4,100′, NE of Khontum, South Vietnam, 9 and 10.vi.1960, R. Leech and Lim Boo Liat.

Standard Data in Micra of Larval Scutum of W. lewthwaitei (*Wom.*).

AW.	PW.	SB.	ASB.	PSB.	SD.	AP.	AM.	AL.	PL.
70	81	39	32	23	55	43	43	35	38
67	79	37	33	24	57	47	46	38	36

Walchiella oudemansi (Walch). Figs 45–46.

Trombicula oudemansi Walch, 1922, *Geneesk. Tijd. Ned.-Ind.*, 62: 563. Figs 18–21. *Neoschöngastia bodensis* Gunther, 1940, Proc. Linn. Soc. N.S.W., 65: 482.* *Euschöngastia* (*Walchiella*) *"FAT"* Audy, 1956, *Bull. Raffles Mus.*, 28: 96.

Diagnosis.—Chelicerae with widely set dentations, see Audy and Domrow (1957), fig. 10.

Material Examined.—Of *oudemansi*, eighty-six larvae from a flying squirrel, *Petaurista petaurista* (Sciuridae), Kepong, Selangor, 26.ix.1952; two larvae from *Echinosorex gymnurus*, Ulu Langat, Selangor, 18.xii.1951; twenty-five larvae from *Rattus*

* Audy says a third form in his care "labelled *N. bodensis* by Gunther is a distinct undescribed species". The slide in question is labelled (with a South Australian Museum label in Womersley's hand) "Paratype *Neoschöngastia bodensis* Gthr., on mouse deer, Bode Rv., B. N. Borneo, 8/39, C. Gth." (Gunther says the specimens were collected in September, 1939, by G. M. Rio). The label further bears a pencilled note by Womersley "not so", which is correct—the specimen is a *Guntherana*, apparently a mislabelled *G.* (*Derrickiella*) *smithi* (Womersley).

Walchiella calunosa (Traub and Audy).

Euschöngastia (*Walchiella*) *calunosa* Traub and Audy, 1954, *Stud. Inst. med. Res., Malaya*, 26: 84. Figs 36–45.

Diagnosis.—Chelicerae simple; dorsal setae 28–30, uniform in length, and not set on platelets; scutum large.

Material Examined.—Four paratype larvae from *Rattus rattus baluensis*, Kamborangah, Mt. Kinabalu, 7,800′, British North Borneo.

Standard Data in Micra of Larval Scutum of W. impar (*Gunther*).*

AW.	PW.	SB.	ASB.	PSB.	SD.	AP.	AM.	AL.	PL.
47	62	25	22	21	43	31	36	19	13
48	63	26	23	22	45	31	—	21	13
49	63	27	23	—	—	31	—	19	13
50	65	27	22	22	44	31	35	21	11
60	70	32	26	23	49	32	36	21	13

* All from Gunther's paratypes, the first four exhibiting unstressed scuta. The fifth specimen has its scutum stretched and minutely cracked as figured by Traub and Evans (1957) for *Gahrliepia* (*Walchia*) *rustica* (Gater). Thus measurements involving the scutum itself are large, while the lengths of setae are normal.

Walchiella lewthwaitei (Womersley). Figs 47–55.

Schöngastia (*Schöngastia*) *lewthwaitei* Womersley, 1952, *Rec. S. Aust. Mus.*, 10: 154.

Diagnosis.—Chelicerae simple; dorsal setae more than 40, not set on platelets.

Material Examined.—Two paratype larvae from *Tupaia glis belangeri* Imphal, Manipur, India.

Walchiella traubi (Womersley). Figs 56–63.

Schöngastia (*Ascoschöngastia*) *traubi* Womersley, 1952, *Rec. S. Aust. Mus.*, 10: 222.

Diagnosis.—Chelicerae simple. Dorsal setae set on distinct platelets.

Material Examined.—One paratype larva from *Suncus* sp. (Soricidae), Shinbwiyang, Burma; four larvae from scrotum of two *Rattus niveiventer* (identified by Lim), plateau at 4,100′, NE of Khontum, South Vietnam, 9 and 10.vi.1960, R. Leech and Lim Boo Liat.

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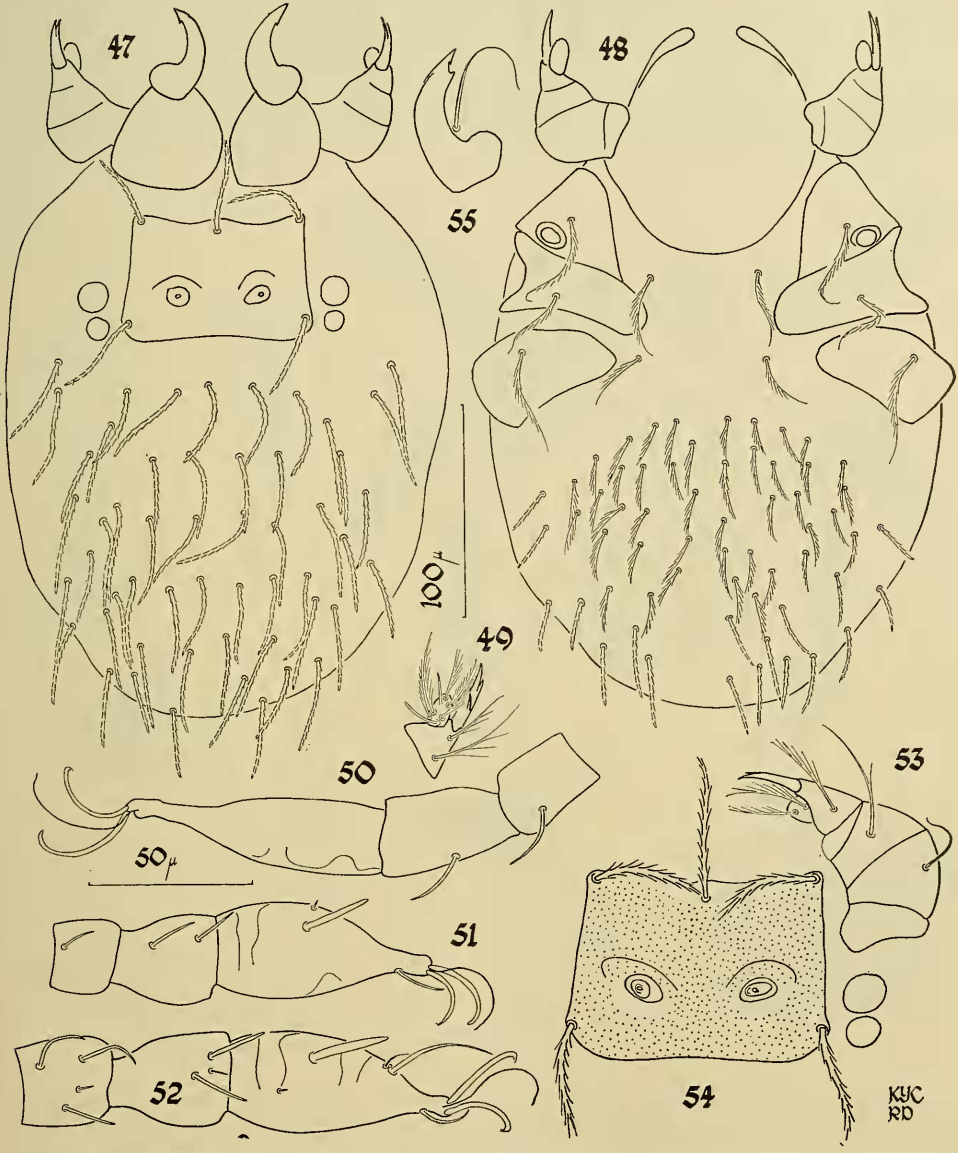
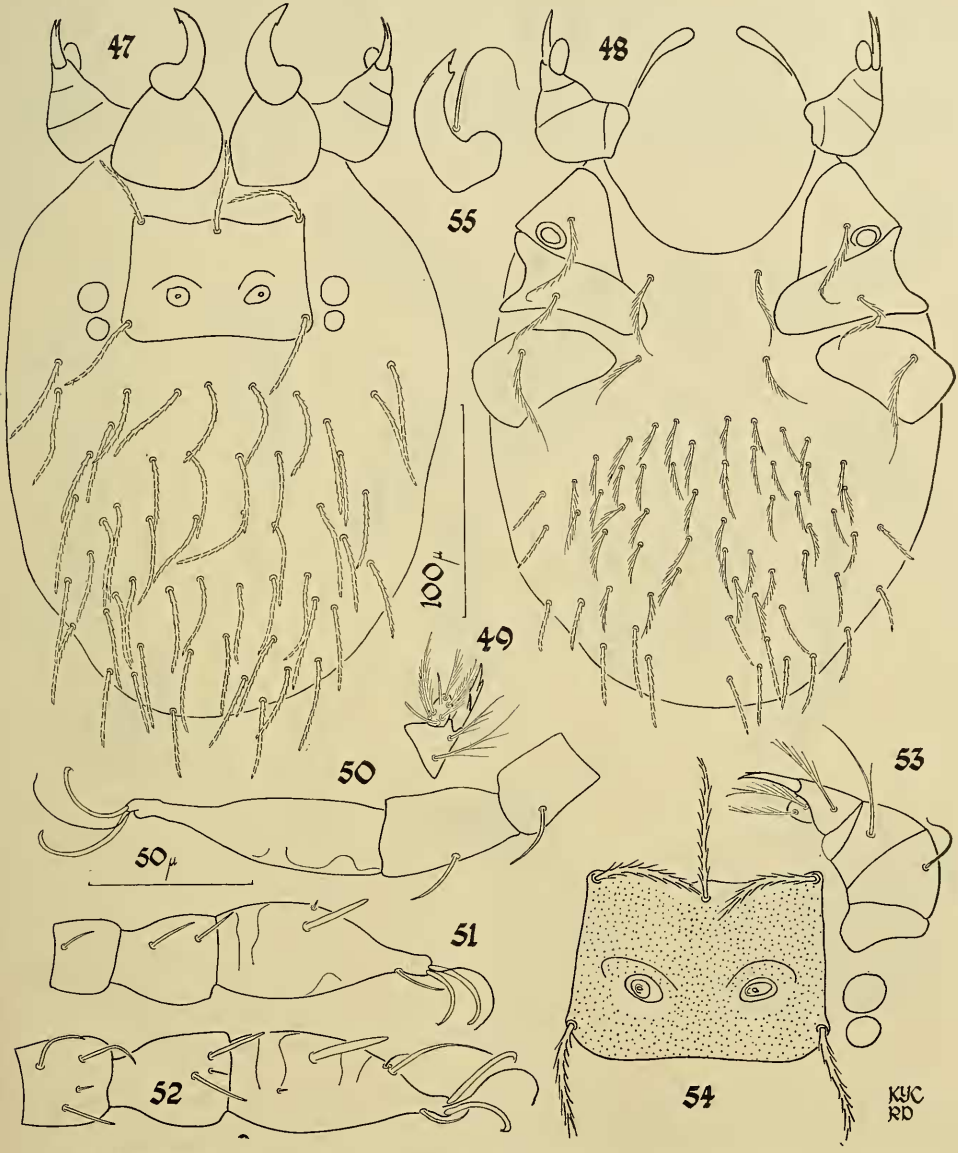
mülleri, Ulu Langat, 2.ix.1952; one larva from *R. mülleri*, Pahang Road, 30 miles from Kuala Lumpur, 17.v.1956; two larvae from *R. mülleri*, Ulu Gombak, Selangor, 25.vii.1956 and 29.ix.1956; one larva from *R. mülleri*, Ampang, Selangor, 5.viii.1959; five larvae from *R. mülleri*, Ulu Langat, 17.xi.1959; one larva from *R. bowersi*, Ulu Langat,



Text-figs 47-55. *Walchiella lewthwaitei* (Womersley).—47, Dorsum of body; 48, Venter of body; 49, Ventral aspect of palpal tibiotarsus; 50, 51 and 52, Specialized setation of legs III, II and I, respectively; 53, Dorsal view of gnathosoma; 54, Scutum and eyes; 55, Galeal seta, and chelicera in lateral view.

17.xi.1950; eleven larvae from *R. canus*, Bukit Lanjan, Selangor, 5.ix.1949; ten larvae from *Chiropodomys gliroides*, Kepong, 1.xii.1952; one larva from *Tupaia minor*, Mt. Kinabalu, British North Borneo, July 1951; five larvae from *T. montana*, Mt. Kinabalu, July 1951; one larva from *T. montana*, Mt. Kinabalu, no date; two larvae from *R.*

mülleri, Ulu Langat, 2.ix.1952; one larva from *R. mülleri*, Pahang Road, 30 miles from Kuala Lumpur, 17.v.1956; two larvae from *R. mülleri*, Ulu Gombak, Selangor, 25.vii.1956 and 29.ix.1956; one larva from *R. mülleri*, Ampang, Selangor, 5.viii.1959; five larvae from *R. mülleri*, Ulu Langat, 17.xi.1959; one larva from *R. bowersi*, Ulu Langat,



Text-figs 47-55. *Walchiella lewthwaitei* (Womersley).—47, Dorsum of body; 48, Venter of body; 49, Ventral aspect of palpal tibiotarsus; 50, 51 and 52, Specialized setation of legs III, II and I, respectively; 53, Dorsal view of gnathosoma; 54, Scutum and eyes; 55, Galeal seta, and chelicera in lateral view.

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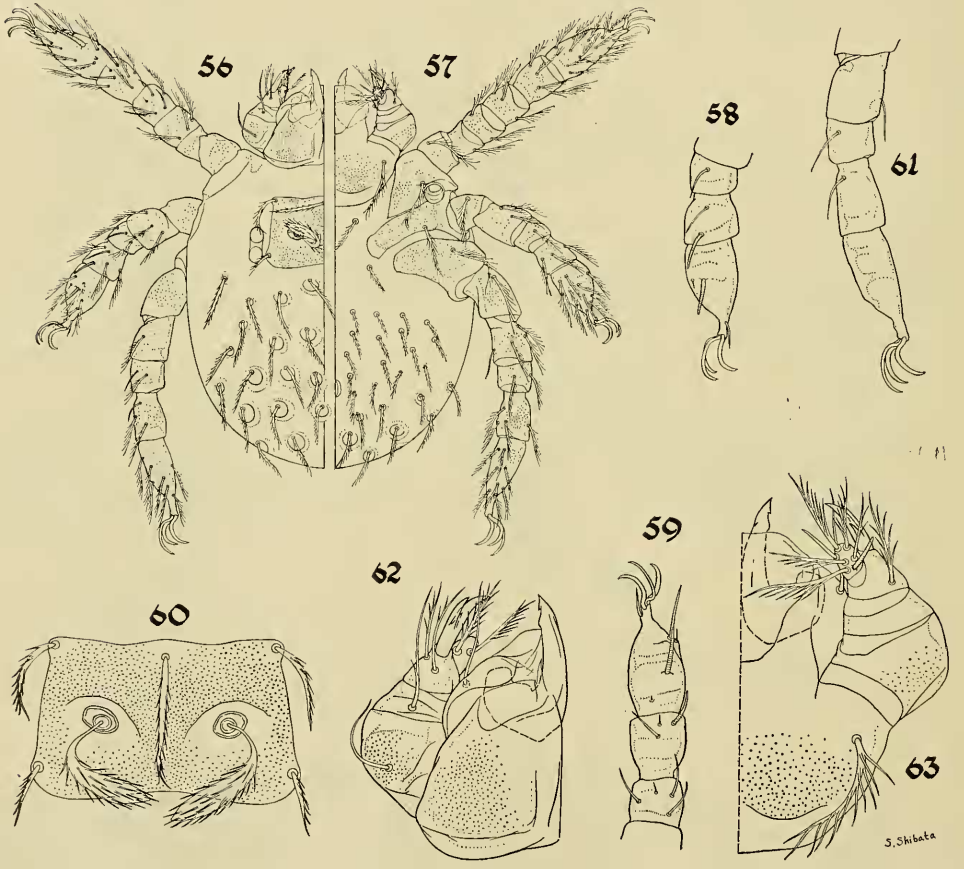
exulans, Mt. Kinabalu, July 1951; three larvae from *T. montana*, Kuching, Sarawak, 20.x.1951; three larvae from *T. glis ferruginea*, Kuching, 22.xi.1950; one larva from ear of rat, Milne Bay, New Guinea, August 1943.

Of *bodensis*, the holotype larva and two paratype larvae from a mouse deer, *Tragulus borneanus* (Tragulidae), Bode R., British North Borneo. These are all on one slide, the holotype not being specially marked, and are accompanied by one larva of *Eutrombicula wichmanni* (Oudemans). At present, the specimens are arranged in the form of a triangle ◁, with a larva in each corner, and one half-way down the vertical side. The specimen at the top is *E. wichmanni*, and I would suggest the specimen half-way down the vertical side be regarded as the holotype, since it shows the dentate chelicerae most clearly, as figured.



Text-figs 56-63.—*Walchiella traubi* (Womersley).—56, Dorsum of body; 57, Venter of body; 58 and 59, Specialized setation of legs II and I, respectively; 60, Scutum; 61, Specialized setation of leg III; 62 and 63, Dorsal and ventral views of gnathosoma, respectively.

Acknowledgements.

I am most grateful to Mr. D. J. Lee for the loan of type material of both Gunther's species, and 406 General Medical Laboratory, Yokohama, for the plates by Messrs. S. Shibata and A. Shimazoe.

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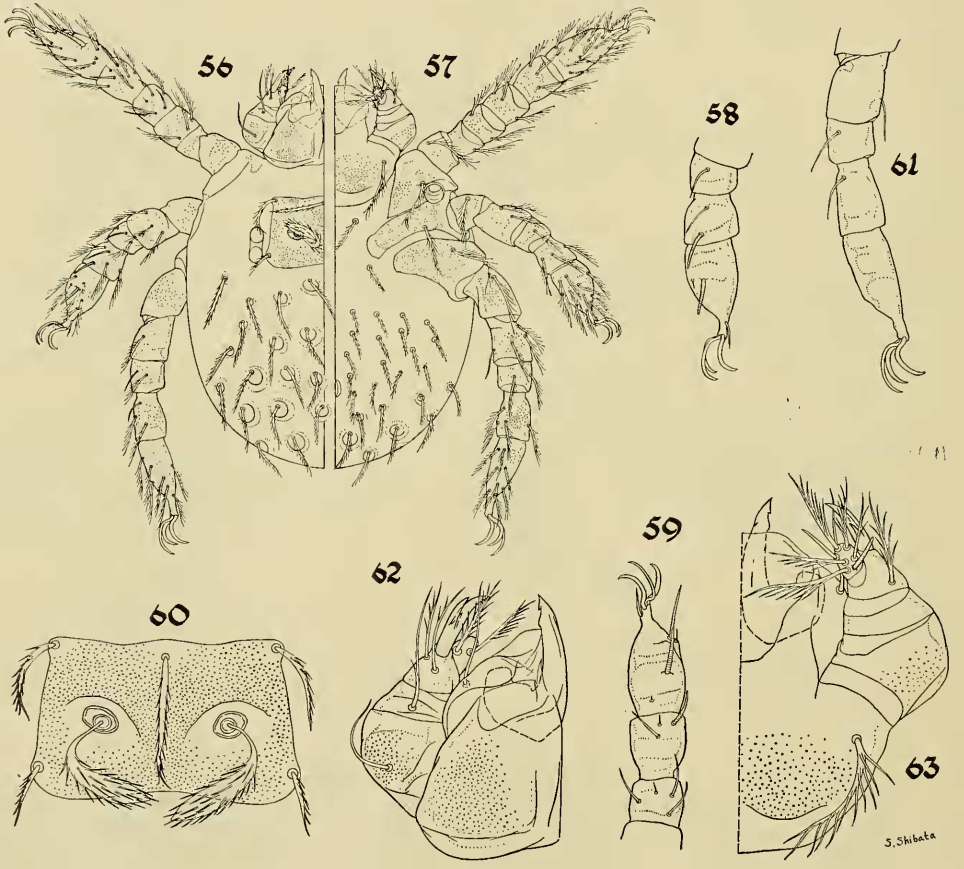

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